Database

كلية التربية للعلوم الصرفة/ ابن الهيثم

المرحلة الثانية

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Introduction

- **Database (DB):** Database is a collection of interrelated data stored together without harmful or unnecessary redundancy to serve multiple applications.
- **Database management system (DBMS):** are specially designed applications that interact with the user, other applications, and the database itself to capture and analyze data.

A general-purpose (DBMS) is a software system designed to allow the definition, creation, querying, update, and administration of DB, Well-known DBMSs include:

- MySQL
- Microsoft SQL Server
- Oracle
- FoxPro
- IBM DB2
- A database is not generally portable across different DBMS, but different DBMSs can be using standards such as SQL (Structure Query Language) and ODBC (Open Database Connectivity) or JDBC (The Java Database Connectivity) to allow a single application to work with more than one database.

Database Administrator (DBA):

is a person responsible for the performance, integrity and security of a database. He will also be involved in the planning and developing of the DB, as well as troubleshooting any issues on behalf of the users.

Purpose of Database Systems: (Why DB?)

- From the centralized control there are some advantages such as:

1. **Redundancy can be reduced:** In non-database systems each application has its own private files. That fact can often lead to considerable redundancy in stored data, which resultant waste in storage space.
2. **Inconsistency can be avoided:** If we have redundant data in one file, at such time the DB is said to be inconsistent. (If the redundancy is removed or controlled then the DB is never inconsistent as seen by the user).
3. **The data can be shared:** We mean that individual pieces of data in the DB may be shared among several different users and applications, in that each of those users may have access to the same piece of data.

4. **Standards can be enforced:** The database administrator (DBA) can ensure that all applicable standards are observed in the representation of the data.
5. **Security restriction can be applied:**

- The DBA can ensure that the only means of access to the DB is through the proper channels.
- The DBA can define security checks to be carried out whenever access is attempted to sensitive data.

6. **Integrity can be maintained:** Integrity means ensuring that the data in the DB is accurate. Inconsistency between two entries that represent the same fact is an example of integrity (Even if there is no redundancy however, the DB may still contain incorrect information). The DBA can define integrity checks to be carried out whenever any update operation is attempted.
7. **Data Independence:** It is the immunity of application to change in storage structure and access strategy, which implies that the application concerned do not depend on any one particular storage structure and access strategy.

Classification of DBMS

- Database management systems can be classified based on several criteria, such as the data model, user numbers and database distribution.

1. **Classification Based on Data Model:** A Database model defines the logical design and structure of a database. It defines how data will be stored, accessed, and updated in a database management system.

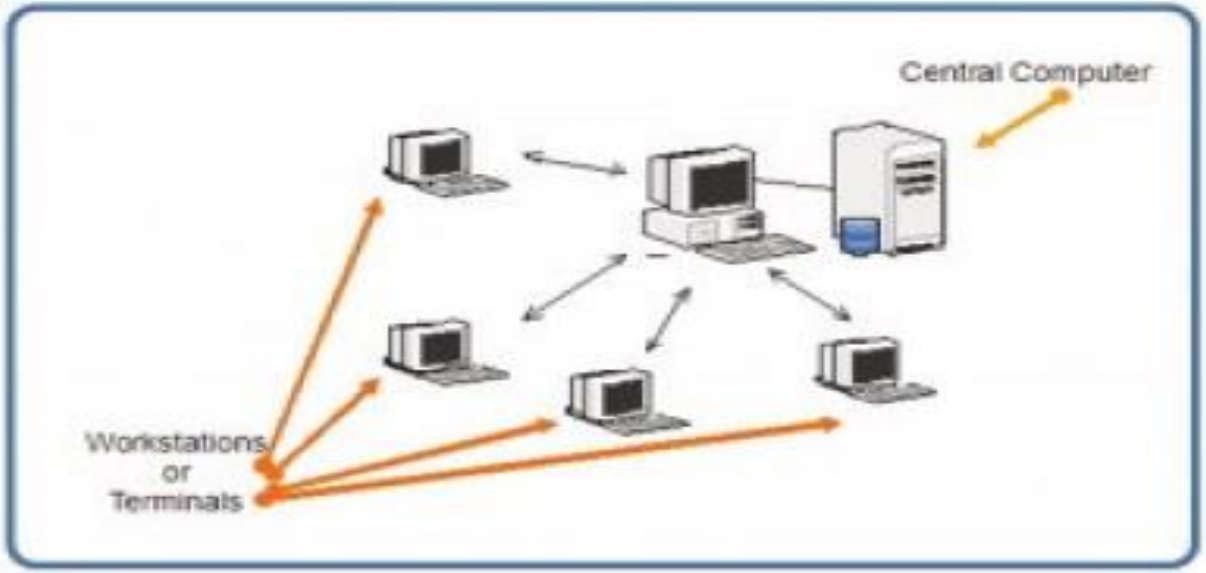
Types of DB models:
• Network
• Hierarchical
• Relational
• Entity-Relationship
• Extended Relational
• Object-oriented
• Object-relational
• Semi-structured(XML/ Extensible Markup Language)
• NoSQL

2. Classification Based on User Numbers It can be a single-user database system, which supports one user at a time, or a multiuser database system, which supports multiple users concurrently.

3.Classification Based on Database Distribution

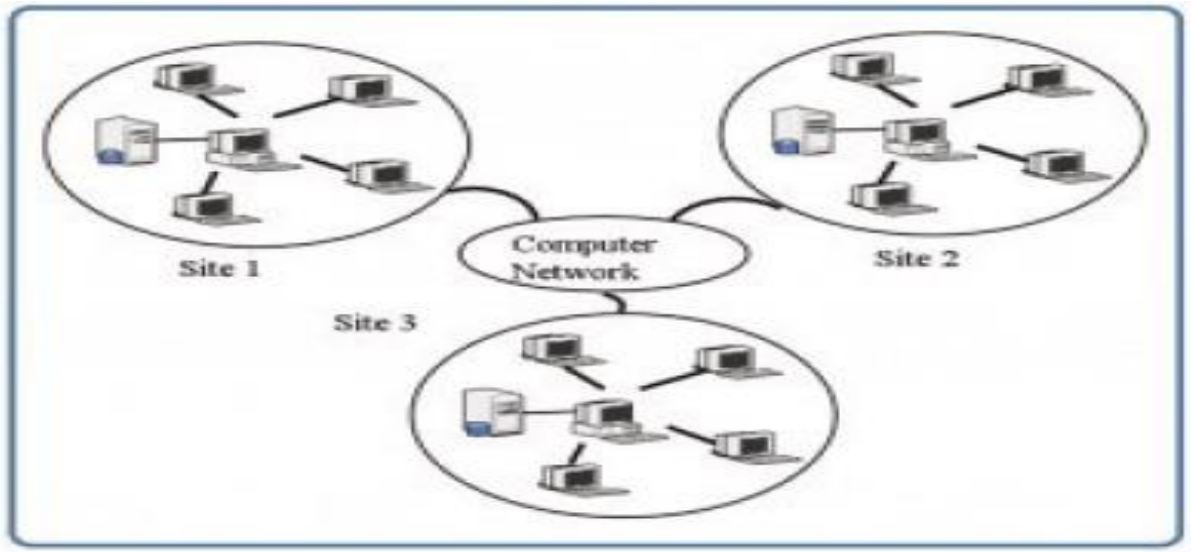
3.1 Centralized systems:

- With a centralized database system, the DBMS and database are stored at a single site that is used by several other systems too.



Fig(1) centralized DB

3.2 Distributed database system: In a distributed database system, the actual database and the DBMS software are distributed from various sites that are connected by a computer network, A distributed database system allows applications to access data from local and remote databases as shown in Fig(2).



Fig(2) Distributed DB

- **Homogeneous distributed database systems:** Homogeneous distributed database systems use the same DBMS software from multiple sites. Data exchange between these various sites can be handled easily.

- **Heterogeneous distributed database systems:** In a heterogeneous distributed database system, different sites might use different DBMS software, but there is additional common software to support data exchange between these sites.

Database Administrator (DBA)

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